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(54) **Thermoshrinking tunnel oven for making thermoshrinking plastic material film packages and the packaging method performed thereby**

Tunnelofen zur Herstellung von Heiss Schrumpffolienpackungen und damit durchgeführtes Verpackungsverfahren

Four tunnel pour la fabrication d'emballages à feuille thermorétractable et procédé d'emballage ainsi effectué

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a tunnel oven for making thermoshrinking material films packages.

[0002] The invention also relates to a packaging method for providing packages, the method being carried out in the inventive tunnel oven.

[0003] More specifically, the field of the invention is that of the tunnel ovens used for making thermoshrinking material film packages, for example for packaging bottles, cans and the like.

[0004] Prior systems for packaging articles in general, such as bottles, cans and so on, in thermoshrinking plastic material films, provide to use heated tunnel ovens, inside which the packages as preliminarily enveloped by the mentioned thermoshrinking film are conveyed. One of such prior tunnels is represented by the shrinking tunnel of the type ST 70-50, sold and delivered by the firm SOTOC cmbH (Donzdorf-Germany)

[0005] The tunnel oven is heated by hot air jets, oriented against the articles to be packaged.

[0006] The size of the tunnel oven is so selected as to be compatible to the size of the articles to be packaged, to provide an efficient heating and thermoshrinking process.

[0007] The above mentioned prior solutions are however affected by several drawbacks.

[0008] At first, the thermoshrinking plastic material films have usually an uneven thickness, which is conventionally modified by the application of decorations or advertisement patterns, which are randomly printed on the film surfaces.

[0009] Thus, the aspect of the obtained packages is frequently altered, thereby reflecting an improper packaging process.

[0010] Furthermore, the requirement of designing the oven tunnels with a size related to that of the articles to be packaged represents a great limitation preventing the same oven from being used for articles of different size, i.e. having a size different from that for which the tunnel oven has been constructed.

[0011] A further drawback of the tunnel ovens of the prior art is that the film material enveloping the packaged articles tend to adhere to the chain conveying means of the oven, thereby hindering a proper hot air flow, and leaving undesired marks on the bottoms of the packaged articles, and, moreover, undesirably depositing plastic material debris on the oven conveying chains.

[0012] Tunnel ovens in accordance with the preamble of claim 1 are known from US 3526752 A and US 4597247A.

SUMMARY OF THE INVENTION

[0013] Accordingly, the aim of the present invention is to improve prior tunnel ovens, for making packages de-

void of surface unevennesses to be used for a broad range of the article to be packaged size.

[0014] The above aim, as well as yet other objects, are achieved by tunnel oven and packaging method as respectively defined by claims 1 and 18.

[0015] Preferred embodiments of the tunnel oven and packaging method according to the present invention are defined by the subclaims.

[0016] With respect to the prior art, the tunnel oven and packaging method according to the present invention provide the advantage of providing thermoshrinking material packages devoid of surface unevennesses, and of even aspect, owing to the use of controlling means for controlling the air flows.

[0017] In a preferred embodiment the invention provides moreover that it allows to process, in the same tunnel oven, packages of differently sized articles.

[0018] Furthermore, the provision of control systems for controlling the temperature of the air flow and for cleaning the article conveying chains, provides packages devoid of surface defects.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The tunnel oven and packaging method according to the present invention will be disclosed in a more detailed manner hereinafter with reference to a preferred embodiment thereof, which is illustrated, by way of an indicative, but not limitative example, in the figures of the accompanying drawings, where:

Figure 1 is a perspective view of the overall tunnel oven according to the present invention;

Figure 2 is a front view illustrating the tunnel oven shown in figure 1;

Figure 3 illustrates a detail of the cleaning device for cleaning the chain conveying means of the tunnel oven shown in figure 1;

Figure 4 is a schematic view illustrating the tunnel oven of figure 1, with the top covering removed therefrom, in order to show the hot air bottom flow outlets; Figure 5 is a broken away view of the tunnel oven of figure 1, specifically showing the deflection outlets or ports for deflecting the hot air top flows toward the oven fan;

Figure 6 illustrates the arrangement of the hot air side outlets of the tunnel oven shown in figure 2;

Figure 7 illustrates the conveying device for conveying the hot air flows to the top portion of the tunnel oven;

Figure 8 illustrates the arrangement of the cooling fans of the chain conveying means at the front portion of the tunnel oven shown in figure 1;

Figure 9 illustrates a modified embodiment of the tunnel oven shown in figure 8;

Figure 10 illustrates a detail of a control device for controlling the bottom air flows of the oven tunnel shown in figure 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] The tunnel oven according to the present invention has been generally indicated in figure 1 by the reference number 1.

[0021] Said tunnel oven comprises a bottom supporting base 2, supporting a covering element 3 defining, with said base 4, the thermoshrinking chamber 4 of the tunnel oven.

[0022] Said bottom base 2 comprises a chain conveyor 5, provided for receiving a plurality of articles 6 to be packaged (in figure 1 said articles comprising bottles) which are preliminarily enveloped by a thermoshrinking material film 7.

[0023] Immediately under the package 16 bearing surface, a plurality of fans 8 are provided on the chain conveying means 5.

[0024] As is clearly shown in figure 4, the fans are arranged outside the covering element 3 and are designed for cooling down the chain conveying means 5, thereby preventing the chain conveying means for achieving the thermoshrinking temperature of the film 7.

[0025] The control means for controlling the hot air flows exiting the bottom portion of the tunnel oven and directed to the packages are shown in figures 4, 8 and 10.

[0026] More specifically, said hot air flow control means comprise a plate 9, including a plurality of holes or slots 10, said plate extending through the overall length of the tunnel oven 1.

[0027] With said plate 9 are associated slider elements 11, preferably in a overlapping relationship with respect to said plate, said slider elements adjoining one another in a slidable manner and comprising a plurality of holes 12 or perforations, registering with the holes 10 of said plate 9.

[0028] The slider elements 11 on the plate 9 are driven, in the direction of the arrows F of figure 8, by a driving mechanism including corresponding shafts 13 and levers 14, and in turn driven by corresponding driving knobs 15.

[0029] Preferably, the driving knobs 15 controlling the displacement of the slider elements or drawers 11 are independently arranged on the base 2, at both walls and on the two ends of the tunnel oven 1.

[0030] Thus, by operating the mentioned driving knobs, it is possible to achieve two different positions of the slider elements or drawers 11 on the plate 9 and, more specifically:

1. a full opening position in which the holes 10 of the plate 9 are fully opened, and the holes 12 of the slider elements 11 are brought into registration with said holes 10, and
2. a fully closing position, in which the holes 10 of the plate 9, with the slider elements 11 are arranged so that the holes 12 thereof are fully offset with respect to the holes of said plate 9.

[0031] In this connection it should be apparent that it would be possible to achieve intermediate adjustments, providing a partial closure of the holes 10 of the plate 9.

[0032] The bottom base 2 of the tunnel 1 comprises a covering element 3 on which are mounted hot air circulating fans 17.

[0033] As is clearly shown in figure 2, the fans 17 cause air to be directed inside the gap 18 of the covering element 3, in which are arranged resistances 19 for heating said air.

[0034] The thus heated air flow is oriented toward the base 2 and is upward directed, starting from the bottom 20 of the thermoshrinking chamber 4, by passing through the holes of the plate 9 and of the slider elements 11.

[0035] The air flow provided by said fans 17 is also oriented in the direction of the perforated top plate 21 and perforated top slider element 22 assembly, having a construction and an arrangement analogous to those of the bottom plate 9 and bottom slider elements 11, as thereinabove disclosed.

[0036] In particular, the top slider elements or drawers 22 comprises, at a respective end portion thereof, knobs 23 for driving said slider elements in the direction of the arrows F of figure 5, thereby closing, in a partial manner, the holes of the plate 21 for allowing air to enter the thermoshrinking chamber 4.

[0037] In order to provide the air flow exiting from the bottom base 2 with a profile like that of the package 16, the top slider elements 22 are so driven as to close the side surfaces of the plate 21, while leaving open the central portion of said plate, corresponding to the position of the package 16.

[0038] In this connection it should be apparent that the number of slider elements or drawers which are left open will depend on the size of the packages or number of the simultaneously processed packages.

[0039] For some applications, in which the top region of the packages 16 must not be affected by an excessive heat, the holes of the top plate 21 are fully closed by the slider elements 22, and the air upward flowing from the bottom base 2 will be discharged through the openings 25 formed through the top portion of the side walls 24 of the covering element 3.

[0040] In the modified embodiment shown in figure 6, the air flow provided by the fans 17 is partially deflected by a baffle 26, driven by a corresponding knob 27, provided on the side walls 24 at the rear portion of the tunnel oven 1, or processed packages outlet portions.

[0041] As shown in figure 2, the fans 17 draw air from the thermoshrinking chamber in the direction indicated by the arrows 29, at a further fan 28.

[0042] Then, as is shown in figure 7, the drawn air flow is at the start conveyed into a cyclone 30 and being then conveyed from the latter, by deflecting walls 31, through the overall length of the gap 18 of the covering element 3 (see the arrows 32 of figure 2).

[0043] The top plate 21 and top slider element 22 system (see figure 5) can be arranged, at an adjustable

height above the bottom base 2 supporting the chain conveying means 5, by supporting brackets 33 which can slide in slots 34 formed on said side walls 24.

[0044] The adjusted in height position of the plate 21 and of the slider elements 22 is locked by locking screws (not shown), operating between the walls 22 and brackets 33.

[0045] This height is selected depending on the size of the packages 16 to be processed in the tunnel oven.

[0046] The cleaning of the chain conveying means 5 is performed by the cleaning device shown in figure 3.

[0047] This cleaning device comprises a rotary brush 35 arranged at the package 16 inlet region.

[0048] For providing an efficient cleaning of the chain conveying means 5, the cleaning brush 35 is advantageously adapted to rotate in a direction opposite to the sliding direction of the conveying chain.

[0049] The driving of the cleaning brush 35 is at a temporary driving and is controlled by a pneumatic cylinder 36 driving a brush supporting lever 37.

[0050] The lever 37 supports moreover a gear wheel 38 coupled to the brush 35 and engaging with a corresponding gear wheel 39 for driving the chain conveying means.

[0051] Thus, as the lever 37 is driven, the two gear wheels 38 and 39 are mutually engaged, thereby causing the cleaning brush 35 to be moved toward the conveying chain 5, to contact the latter.

[0052] The driving of the cylinder 36 is controlled by a preset controlling program.

[0053] Advantageously, on the package 16 outlet section, are provided a plurality of IR lamps 40, arranged on the side walls 24 of the covering element 3, as shown in figure 9.

[0054] If a plurality of packages arranged on a plurality of rows are supplied, then the lamps 40 will be also arranged between a row of packages and another row thereof.

[0055] The mentioned lamps operate to concentrate the heat on the side walls of the packages, requiring a great amount of heat as necessary for properly extend the film.

[0056] The invention, as disclosed and shown in the figures of the accompanying drawings, is susceptible to several modifications and variations, without departing from the scope of the following claims.

[0057] Thus, for example, the plurality of bottom slider elements 11 and top slider elements 22 can be replaced by a single bottom slider element and a single top slider element, even arranged under the related plate, respectively 9 and 21.

Claims

1. A thermoshrinking tunnel oven (1) for making packages (16) of thermoshrinking material film (7), said tunnel oven comprising:

(i) a covering element (3) and a bottom supporting base (2), said covering element (3) having walls defining a thermoshrinking air passage gap (18) for conveying thermoshrinking air under said packages,

(ii) a perforated bottom plate (9) arranged under said packages (16) and associated with at least a bottom slider element (11), also perforated, which is slidably mounted with respect to said perforated bottom plate (9), thereby opening and closing the holes (10) of said plate for directing hot air, supplied by hot air supplying fans (17), towards said packages (16).

(iii) a perforated top plate (21) arranged over said packages (16) and associated with at least a top slider element (22), also perforated, which is slidably mounted with respect to said perforated top plate (21), thereby opening and closing the holes of said plate (21),

characterized in that

(iv) said top plate (21) is provided with adjustable height supporting means, adapted for adjusting the height of said top plate (21) and said at least top slider element (22) with respect to said package supporting bottom plate (9).

2. An oven according to Claim 1, **characterized in that** said supporting means comprise supporting brackets (33) for supporting the plate and slider element assembly, said supporting brackets (33) being slidably mounted in corresponding slots (34) formed through said side walls (24) of said covering element (3).
3. An oven according to Claim 2, **characterized in that** said at least a bottom slider element (11) comprises a shaft (13) and lever (14) driving device, controlled by a corresponding knob (15), and designed to slidably drive said slider element (11) with respect to said plate (9).
4. An oven according to Claim 2, **characterized in that** said oven comprises a plurality of mutually adjoining said bottom slider elements (11) thereby covering all said bottom plate (9).
5. An oven according to Claim 1, **characterized in that** in said gap (18) a plurality of heating resistances (19) for heating air supplied by said fans (17) are provided.
6. An oven according to Claim 1, **characterized in that** said oven comprises a plurality of said top independently driven slider elements (22), covering all said perforated top plate (9).
7. An oven according to Claim 1, **characterized in that** the side walls (24) of said covering elements (3) have

side surfaces comprising a plurality of openings for discharging thermoshrinking air therefrom.

8. An oven according to Claim 1, **characterized in that** said oven comprises moreover a baffle (26) arranged on said walls (24) of said covering elements. 5
9. An oven according to Claim 1, **characterized in that** said fans comprises a cyclone (30) and deflecting walls (31) for conveying air through said gap (18). 10
10. An oven according to Claim 1, **characterized in that** said oven comprises at least a chain conveyor means (5) for conveying said packages (16) in said thermoshrinking chamber (4), cooling fans for cooling said chain means being arranged under said conveying chain means (5), outside of said thermoshrinking chamber (4). 15
11. An oven according to Claim 10, **characterized in that** said oven comprises moreover cleaning means (35) for cleaning said chain means (5) as said packages (16) are conveyed and thermoshrunk. 20
12. An oven according to Claim 11, **characterized in that** said cleaning means (35) comprise a rotary brush (35) arranged at a package inlet region of said tunnel oven (1) and adapted to clean said chain means (5) as said chain conveys said packages (16). 25
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13. An oven according to Claim 12, **characterized in that** said cleaning brush (35) is swingably mounted to swing respectively between a position interfering against said chain means (5) for cleaning said chain means (5), and a rest position, in which said cleaning brush (35) is removed from said chain means (5). 35
14. An oven according to Claim 13, **characterized in that** said oven comprises moreover a supporting lever (37) for supporting said cleaning brush (35) and a gear wheel (38) driving said cleaning brush (35) and supported by said lever (37), said gear wheel (38) being adapted to engage with a further gear wheel (39) for driving said chain means (5). 40
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15. An oven according to Claim 14, **characterized in that** said oven comprises moreover a driving cylinder (36) for driving said lever (37) from a disengagement position of said gear wheels (38, 39) to an engagement position of said gear wheels, in which said cleaning brush (35) is rotatively contacted with said chain means (5). 50
16. An oven according to Claim 1, **characterized in that** said oven comprises moreover a plurality of IR lamps (40) arranged at a package outlet region, at a wall (24) of said covering element (3). 55

17. An oven according to Claim 16, **characterized in that** said lamps (40) are arranged between rows of said packages (16) hereby irradiating the side walls of said packages (16).

18. A method for packaging articles, in particular bottles, in a thermoshrinking film in an oven according to claims 1 to 17, in which air is directed inside said gap (18) of said covering element (3) and is oriented toward said base (2) and is upward directed, starting from the bottom (20) of said thermoshrinking chamber (4), by passing through the holes (10) of said plate (9) and slider elements (11), comprising the steps of

- (a) controlling hot air flows thermoshrinking said film, and
- (b) controlling the flow rate and direction of said air flows, said step (b) being performed by a further step of
- (c) adjusting the cross-section of said variable cross-section holes (10) of the bottom and top perforated plates (9,21) supplying air to a thermoshrinking chamber of said oven,
- characterized in that** said method comprises the further step of
- (d) designing the size of said tunnel oven depending on the size of the packages to be processed, said step (d) being performed by raising or lowering said top plate (21) and top slider element (22) system with respect to said package supporting bottom plate (9).

19. A method according to Claim 18, **characterized in that** said step (b) is performed by independently driving the top slider elements (22) on their corresponding perforate plates (21).

20. A method according to Claims 18 and 19, **characterized in that** the hot air flow has a profile corresponding to each said package, the top slider elements (22) being so arranged as to close the side surfaces of the corresponding plate, while leaving open a central portion of said plate, said central portion corresponding to the positions of said packages.

21. A method according to Claims 18 to 20, **characterized in that** said method comprises moreover the step (e) of controlling the temperature of said chain means (5) conveying said packages.

22. A method according to Claim 21, **characterized in that** said step (e) is performed by impinging air jets in the direction of said chain means (5), by fans (8) arranged outside of said thermoshrinking chamber.

23. A method according to Claims 18 to 22, **characterized in that** said method comprises moreover the

step (f) of cleaning said chain means (5) as said packages are conveyed thereby.

24. A method according to Claim 23, **characterized in that** said cleaning step (f) is performed by temporarily causing said brush (35) to contact said chain means (5) said brush being rotatively driven in a direction opposite to the chain means sliding direction.

Patentansprüche

1. Heißschrumpftunnelofen (1) zur Herstellung von Packungen (16) aus einer Heißschrumpfmateriale (7), wobei der Tunnelofen umfasst:

(i) ein Abdeckelement (3) und eine untere Tragbasis (2), wobei das Abdeckelement Wände aufweist, welche einen Heißschrumpfluft-Durchgangsspalt (18) zum Befördern von Heißschrumpfluft unter die Pakkungen definieren,

(ii) eine gelochte untere Platte (9), welche unter den Packungen (16) angeordnet ist und mit wenigstens einem unteren Schieberelement (11) verbunden ist, welches ebenfalls gelocht ist und welches in Bezug auf die gelochte untere Platte (9) verschiebbar ist, wodurch die Löcher (10) der Platte geöffnet und geschlossen werden, zum Leiten von Heißluft, die von Heißluftzuführgebläsen (17) geliefert wird, zu den Packungen (16),

(iii) eine gelochte obere Platte (21) welche über den Packungen (16) angeordnet ist und mit wenigstens einem oberen Schieberelement (22) verknüpft ist, welches ebenfalls gelocht ist und welches in Bezug auf die gelochte obere Platte (21) verschiebbar ist, wodurch die Löcher der Platte (21) geöffnet und geschlossen werden, **dadurch gekennzeichnet, dass**

(iv) die obere Platte (21) höhenverstellbare Tragmittel umfasst, die dafür ausgelegt sind, die Höhe der oberen Platte (21) und des wenigstens einen oberen Schieberelements (22) in Bezug auf die die Packung tragende untere Platte (9) zu verstellen.

2. Ofen nach Anspruch 12, **dadurch gekennzeichnet, dass** die Tragmittel Tragklammern (33) zum Tragen der Platten- und Schieberelementeinheit umfassen, wobei die Tragklammern (33) in entsprechenden Schlitz (34), welche durch die Seitenwände (24) des Abdeckelements (3) hindurchreichend ausgebildet sind, verschiebbar montiert sind.
3. Ofen nach Anspruch 2, **dadurch gekennzeichnet, dass** das wenigstens eine untere Schieberelement

(11) eine Antriebsvorrichtung aus Welle (13) und Hebel (14) umfasst, welche durch einen entsprechenden Knopf (15) gesteuert wird und so ausgelegt ist, dass die das Schieberelement (11) in Bezug auf die Platte (9) verschiebbar antreibt.

4. Ofen nach Anspruch 2, **dadurch gekennzeichnet, dass** der Ofen eine Mehrzahl der unteren Schieberelemente (11) umfasst, welche aneinander anstoßen, wodurch sie die ganze untere Platte (9) abdecken.

5. Ofen nach Anspruch 1, **dadurch gekennzeichnet, dass** in dem Spalt (18) eine Mehrzahl von Heizwiderständen (19) zum Erwärmen von Luft, welche durch die Gebläse (17) zugeführt wird, vorgesehen ist.

6. Ofen nach Anspruch 1, **dadurch gekennzeichnet, dass** der Ofen eine Mehrzahl der oberen Schieberelemente (22) umfasst, welche unabhängig angetrieben werden und die ganze gelochte obere Platte (9) abdecken.

7. Ofen nach Anspruch 1, **dadurch gekennzeichnet, dass** die Seitenwände (24) der Abdeckelemente (3) Seitenflächen aufweisen, welche eine Mehrzahl von Öffnungen zum Abführen von Heißschrumpfluft aus diesen umfassen.

8. Ofen nach Anspruch 1, **dadurch gekennzeichnet, dass** der Ofen außerdem ein Prallblech (26) umfasst, welches auf den Wänden (24) der Abdeckelemente angeordnet ist.

9. Ofen nach Anspruch 1, **dadurch gekennzeichnet, dass** die Gebläse einen Zyklon (30) und Ablenkwanne (31) zum Befördern von Luft durch den Spalt (18) umfassen.

10. Ofen nach Anspruch 1, **dadurch gekennzeichnet, dass** der Ofen wenigstens ein Kettenfördermittel (5) zum Befördern der Packungen (16) in der Heißschrumpfkammer (4) umfasst, wobei Kühlgebläse zum Kühlen des Kettenmittels unter dem befördernden Kettenmittel (5) außerhalb der Heißschrumpfkammer (4) angeordnet sind.

11. Ofen nach Anspruch 10, **dadurch gekennzeichnet, dass** der Ofen außerdem Reinigungsmittel (35) zum Reinigen des Kettenmittels (5), wenn die Packungen (16) befördert und heiß geschrumpft werden, umfasst.

12. Ofen nach Anspruch 11, **dadurch gekennzeichnet, dass** die Reinigungsmittel (35) eine drehende Bürste (35) umfassen, welche an einer Packungseingangsregion des Tunnelofens (1) angeordnet und so

ausgelegt ist, dass sie das Kettenmittel (5) reinigt, wenn die Kette die Packungen (16) befördert.

13. Ofen nach Anspruch 12, **dadurch gekennzeichnet, dass** die Reinigungsbürste (35) schwenkbar angebracht ist, um zwischen einer Position, welche in das Kettenmittel (5) zum Reinigen des Kettenmittels (5) eingreift, beziehungsweise einer Ruheposition, in welcher die Reinigungsbürste (35) vom Kettenmittel (5) entfernt ist, zu schwingen. 5 10
14. Ofen nach Anspruch 13, **dadurch gekennzeichnet, dass** der Ofen außerdem einen Traghebel (37) zum Tragen der Reinigungsbürste (35) und ein Zahnrad (38), welches die Reinigungsbürste (35) antreibt und durch den Hebel (37) getragen wird, umfasst, wobei das Zahnrad (38) so ausgelegt ist, dass es zum Antreiben des Kettenmittels (5) in ein weiteres Zahnrad (39) eingreift. 15 20
15. Ofen nach Anspruch 14, **dadurch gekennzeichnet, dass** der Ofen außerdem einen Antriebszylinder (36) zum Antreiben des Hebels (37) von einer Trennungsposition der Zahnräder (38, 39) in eine Eingriffsposition der Zahnräder, in welcher die Reinigungsbürste (35) mit den Kettenmitteln (5) drehend in Kontakt ist, umfasst. 25 30
16. Ofen nach Anspruch 1, **dadurch gekennzeichnet, dass** der Ofen außerdem eine Mehrzahl von IR-Lampen (40), welche an einer Packungsauslassregion an einer Wand (24) des Abdeckelements (3) angeordnet sind, umfasst. 35
17. Ofen nach Anspruch 16, **dadurch gekennzeichnet, dass** die Lampen (4) zwischen Reihen der Packungen (16) angeordnet sind und hierdurch die Seitenwände der Packungen (16) bestrahlen. 40
18. Verfahren zum Verpacken von Artikeln, insbesondere Flaschen, in einer Heißschrumpffolie in einem Ofen gemäß Anspruch 1 bis 17, bei welchem Luft zur Innenseite des Spalts (18) des Abdeckelements (3) geleitet wird und zu der Basis (2) hin ausgerichtet wird und nach oben geleitet wird, beginnend am Boden (20) der Heißschrumpfkammer (4), indem sie durch die Löcher (10) der Platte (9) und Schieberlemente (11) durchgeführt wird, umfassend die Schritte 45 50
 - (a) Steuern von Heißluftströmen, welche die Folie heiß schrumpfen, und
 - (b) Steuern der Strömungsgeschwindigkeit und -richtung der Luftströme, wobei der Schritt (b) durch einen weiteren Schritt ausgeführt wird, nämlich 55

(c) Einstellen des Querschnitts der Löcher (10) mit veränderlichem Querschnitt der unteren und der oberen gelochten Platte (9, 21), welche einer Heißschrumpfkammer des Ofens Heißluft zuführen, **dadurch gekennzeichnet, dass** das Verfahren den weiteren Schritt umfasst

(d) die Größe des Tunnelofens in Abhängigkeit von der Größe der zu verarbeitenden Packungen zu bemessen, wobei der Schritt (d) durch Anheben oder Absenken des Systems aus der oberen Platte (21) und dem oberen Schieberelement (22) in Bezug auf die untere Platte (9), welche die Packung trägt, ausgeführt wird.

19. Verfahren nach Anspruch 18, **dadurch gekennzeichnet, dass** der Schritt (b) durch unabhängiges Antreiben der oberen Schieberelemente (22) auf ihren entsprechenden gelochten Platten (21) ausgeführt wird. 20

20. Verfahren nach Anspruch 18 und 19, **dadurch gekennzeichnet, dass** der Heißluftstrom ein Profil aufweist, welches jeder Packung entspricht, wobei die oberen Schieberelemente (22) derart angeordnet werden, dass sie die Seitenflächen der entsprechenden Platte schließen, während sie einen zentralen Abschnitt der Platte offen lassen, wobei der zentrale Abschnitt den Positionen der Packungen entspricht. 25 30

21. Verfahren nach Anspruch 18 bis 20, **dadurch gekennzeichnet, dass** das Verfahren außerdem den Schritt (e) des Regelns der Temperatur des Kettenmittels (5), welches die Packungen befördert, umfasst. 35

22. Verfahren nach Anspruch 21, **dadurch gekennzeichnet, dass** der Schritt (e) durch Auftreffen von Luftstrahlen in der Richtung des Kettenmittels (5) von Gebläsen (8), welche außerhalb der Heißschrumpfkammer angeordnet sind, ausgeführt wird. 40

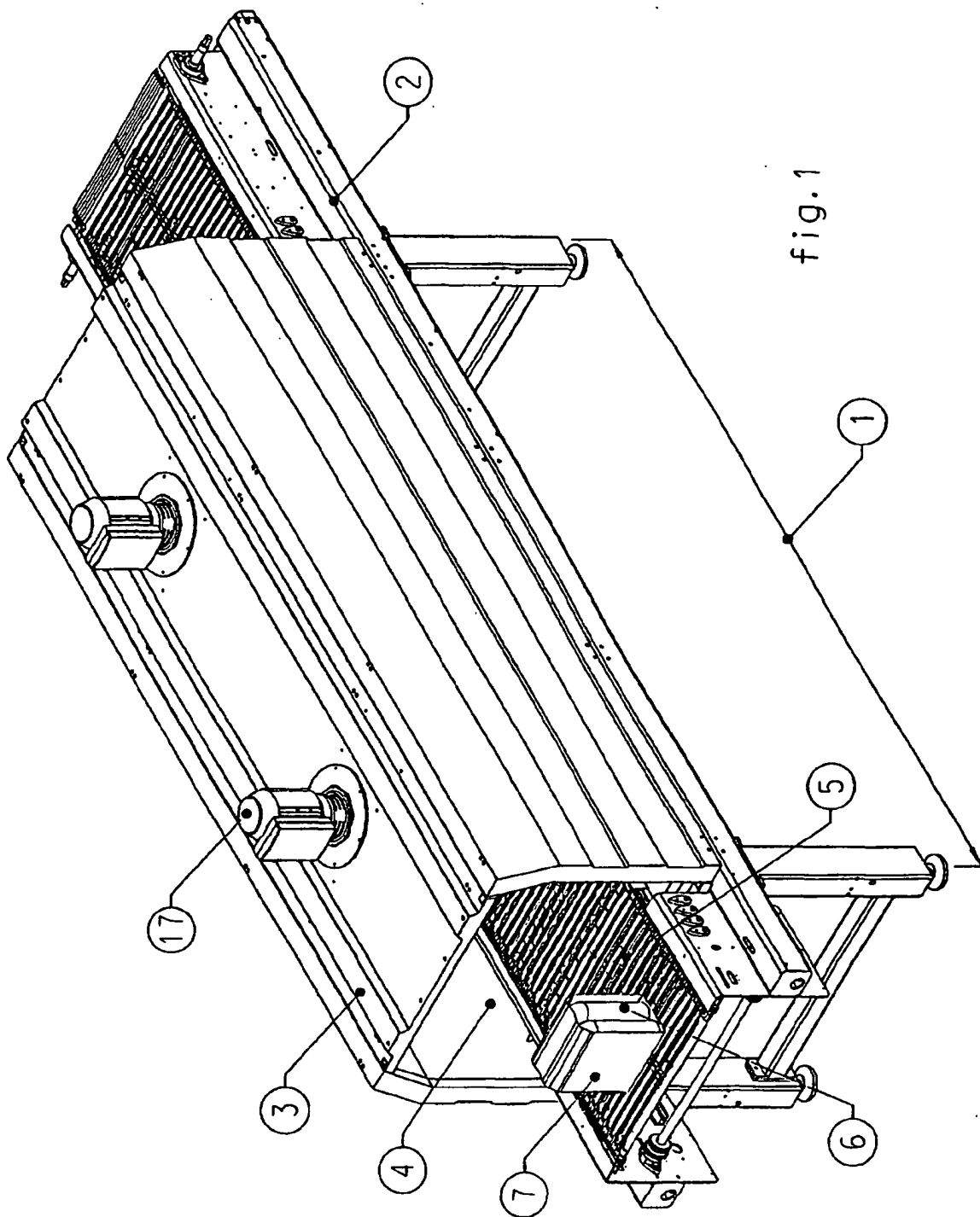
23. Verfahren nach Anspruch 18 bis 22, **dadurch gekennzeichnet, dass** das Verfahren außerdem den Schritt (f) des Reinigens des Kettenmittels (5), wenn die Packungen durch dieses befördert werden, umfasst. 45 50

24. Verfahren nach Anspruch 23, **dadurch gekennzeichnet, dass** der Reinigungsschritt (f) ausgeführt wird, indem bewirkt wird, dass die Bürste (35) das Kettenmittel (5) temporär berührt, wobei die Bürste in einer Richtung drehend angetrieben wird, die der Verschiebungsrichtung des Kettenmittels entgegengesetzt ist. 55

Revendications

1. Four à tunnel de thermorétrécissement (1) pour fabriquer des emballages (16) en film à matériau thermorétractable (7), ledit four à tunnel comprenant :
 - (i) un élément de recouvrement (3) et une base de support inférieure (2), ledit élément de recouvrement (3) possédant des parois définissant un espace (18) pour le passage de l'air de thermorétrécissement, pour transporter l'air de thermorétrécissement en dessous desdits emballages,
 - (ii) une plaque inférieure perforée (9) disposée sous lesdits emballages (16) et associée à au moins un élément coulissant inférieur (11), également perforé qui est monté de manière coulissante par rapport à ladite plaque supérieure perforée (9) de ce fait ouvrant et fermant les orifices (10) de ladite plaque pour diriger l'air chaud, fourni par des ventilateurs d'apport d'air chaud (17), vers lesdits emballages (16),
 - (iii) une plaque supérieure perforée (21) disposée sur lesdits emballages (16) et associée à au moins un élément coulissant supérieur (22), également perforé, qui est monté de manière coulissante par rapport à ladite plaque supérieure perforée (21), de fait ouvrant et fermant les orifices de ladite plaque (21),
 - caractérisé en ce que**
 - (iv) ladite plaque supérieure (21) est munie de moyens de support à hauteur réglable, et adaptés pour régler la hauteur de ladite plaque supérieure (21) et ledit au moins un élément coulissant supérieur (22) par rapport à ladite plaque inférieure de support d'emballage (9).
2. Four selon la Revendication 1, **caractérisé en ce que** lesdits moyens de support comprennent des béquilles de support (33) pour supporter la plaque et l'ensemble des éléments coulissants, lesdites béquilles de support (33) étant montées de manière coulissante dans des fentes correspondantes (34) formées à travers lesdites parois latérales (24) dudit élément de recouvrement (3).
3. Four selon la Revendication 2, **caractérisé en ce qu'**au moins un élément inférieur coulissant (11) comprend un dispositif d'entraînement à arbre (13) et à levier (14), contrôlé par un bouton correspondant (15), et étudié pour actionner de manière coulissante ledit élément coulissant (11) par rapport à ladite plaque (9).
4. Four selon la Revendication 2, **caractérisé en ce que** ledit four comprend une pluralité desdits éléments inférieurs coulissants (11) s'avoisinant mutuellement, de ce fait, recouvrant la totalité de ladite plaque inférieure (9).
5. Four selon la Revendication 1, **caractérisé en ce que** dans ledit espace (18), plusieurs résistances de chauffage (19), pour chauffer l'air alimenté par lesdits ventilateurs (17), sont prévues.
6. Four selon la Revendication 1, **caractérisé en ce que** ledit four comprend une pluralité desdits éléments coulissants (22) actionnés de manière indépendante, recouvrant la totalité de ladite plaque supérieure perforée (9).
7. Four selon la Revendication 1, **caractérisé en ce que** lesdites parois latérales (24) desdits éléments de recouvrement (3) présentent des surfaces latérales comprenant plusieurs ouvertures pour y décharger l'air de thermorétrécissement.
8. Four selon la Revendication 1, **caractérisé en ce que** ledit four comprend de plus un déflecteur (25) disposé sur lesdites parois latérales (24) desdits éléments de recouvrement.
9. Four selon la Revendication 1, **caractérisé en ce que** ledit ventilateur comprend un cyclone (30) et des parois de déflexion (31) pour transporter l'air à travers ledit espace (18).
10. Four selon la Revendication 1, **caractérisé en ce que** ledit four comprend au moins un moyen de transport à chaîne (5) pour transporter lesdits emballages (16) dans ladite chambre de thermorétrécissement (4), des ventilateurs de refroidissement pour refroidir ledit moyen à chaîne, étant de plus disposés en dessous dudit moyen de transport à chaîne (5), à l'extérieur de ladite chambre de thermorétrécissement (4).
11. Four selon la Revendication 10, **caractérisé en ce que** ledit four comprend de plus des moyens de nettoyage (35) pour nettoyer ledit moyen à chaîne (5), lorsque lesdits emballages (16) sont transportés et thermorétractés.
12. Four selon la Revendication 11, **caractérisé en ce que** lesdits moyens de nettoyage (35) comprennent une brosse rotative (35) disposée au niveau d'une région d'entrée de l'emballage dudit four à tunnel (1) et est adaptée pour nettoyer ledit moyen à chaîne, lorsque ladite chaîne transporte lesdits emballages (16).
13. Four selon la Revendication 12, **caractérisé en ce que** ladite brosse de nettoyage (35) est montée de manière oscillante afin d'osciller respectivement entre une position interférant contre le moyen à chaîne (5) pour nettoyer ledit moyen à chaîne (5), et une position de repos, dans laquelle ladite brosse de nettoyage (35) est retirée dudit moyen à chaîne (5).

14. Four selon la Revendication 13, **caractérisé en ce que** ledit four comprend de plus un levier de support (37) pour supporter ladite brosse de nettoyage (35) et une roue à engrenage (39) actionnant ladite brosse de nettoyage (35) supportée par ledit levier (37), ladite roue à engrenage étant adaptée pour s'engager avec une autre roue à engrenage (39) afin d'actionner ledit moyen à chaîne (5).
15. Four selon la Revendication 14, **caractérisé en ce que** ledit four comprend de plus un cylindre d'actionnement (36) pour actionner ledit levier (37) à partir d'une position de désengagement desdites roues à engrenage (38, 39) vers une position d'engagement desdites roues à engrenage, dans laquelle ladite brosse de nettoyage est en contact de manière rotative avec ledit moyen à chaîne (5).
16. Four selon la Revendication 1, **caractérisé en ce que** ledit four comprend de plus plusieurs lampes IR (40) disposées au niveau d'une région de sortie des emballages, au niveau d'une paroi (24) dudit élément de recouvrement (3).
17. Four selon la Revendication 16, **caractérisé en ce que** lesdites lampes (40) sont disposées entre les rangées desdits emballages (16), de ce fait, illuminant les parois latérales desdits emballages (16).
18. Procédé d'emballages d'articles, en particulier, de bouteilles, dans un film thermorétractable dans un four selon les revendications 1 à 17, dans lequel l'air est dirigé à l'intérieur dudit espace (18) dudit élément de recouvrement (3) et orienté vers ladite base (2) et dirigé vers le haut, en commençant par la partie inférieure (20) de ladite chambre de thermorétrécissement (4), en passant par les orifices (10) de ladite plaque (9) et les éléments coulissants (11), comprenant les étapes de
- (a) contrôle des écoulements d'air chaud thermorétractant ledit film, et
 - (b) contrôle du débit et de la direction desdits écoulements d'air chaud, ladite étape (b) étant effectuée par une autre étape
 - (c) de réglage de la section transversale des orifices (10) à section transversale variable des plaques (9, 21) perforées inférieure et supérieure fournissant l'air à une chambre de thermorétrécissement dudit four,
- caractérisé en ce que** ledit procédé comprend l'autre étape de
- (d) conception de la dimension dudit four à tunnel, en fonction de la dimension des emballages à traiter, ladite étape (d) étant effectuée en levant ou en abaissant ledit système à plaque supérieure (21) et éléments coulissants supérieurs (22) par rapport à ladite plaque inférieure sup-
- portant les emballages (9).
19. Procédé selon la Revendication 18, **caractérisé en ce que** ladite étape (b) est effectuée par actionnement indépendant des éléments coulissants supérieurs (22) sur leurs plaques perforées correspondantes (21).
20. Procédé selon les Revendications 18 et 19, **caractérisé en ce que** l'écoulement d'air chaud possède un profil correspondant à chacun desdits emballages, les éléments coulissants supérieurs (22) étant disposés de manière à fermer les surfaces latérales de la plaque correspondante, laissant alors ouverte une portion centrale de ladite plaque, ladite portion centrale correspondant aux positions desdits emballages.
21. Procédé selon les Revendications 18 à 20, **caractérisé en ce que** ledit procédé comprend de plus l'étape (e) de contrôle de la température dudit moyen à chaîne (5) transportant lesdits emballages.
22. Procédé selon les Revendications 21, **caractérisé en ce que** ladite étape (e) est effectuée par des jets d'air incidents dans la direction dudit moyen à chaîne (5), par des ventilateurs (8) disposés à l'extérieur de ladite chambre de thermorétrécissement.
23. Procédé selon les Revendications 18 à 22, **caractérisé en ce que** ledit procédé comprend de plus une étape (f) de nettoyage dudit moyen à chaîne (5) lorsque lesdits emballages sont transportés dessus.
24. Procédé selon la Revendication 23, **caractérisé en ce que** ladite étape de nettoyage (f) est effectuée en provoquant le contact temporaire de ladite brosse (35) sur ledit moyen à chaîne (5), ladite brosse étant actionnée de manière rotative dans une direction opposée à la direction de déplacement du moyen à chaîne.



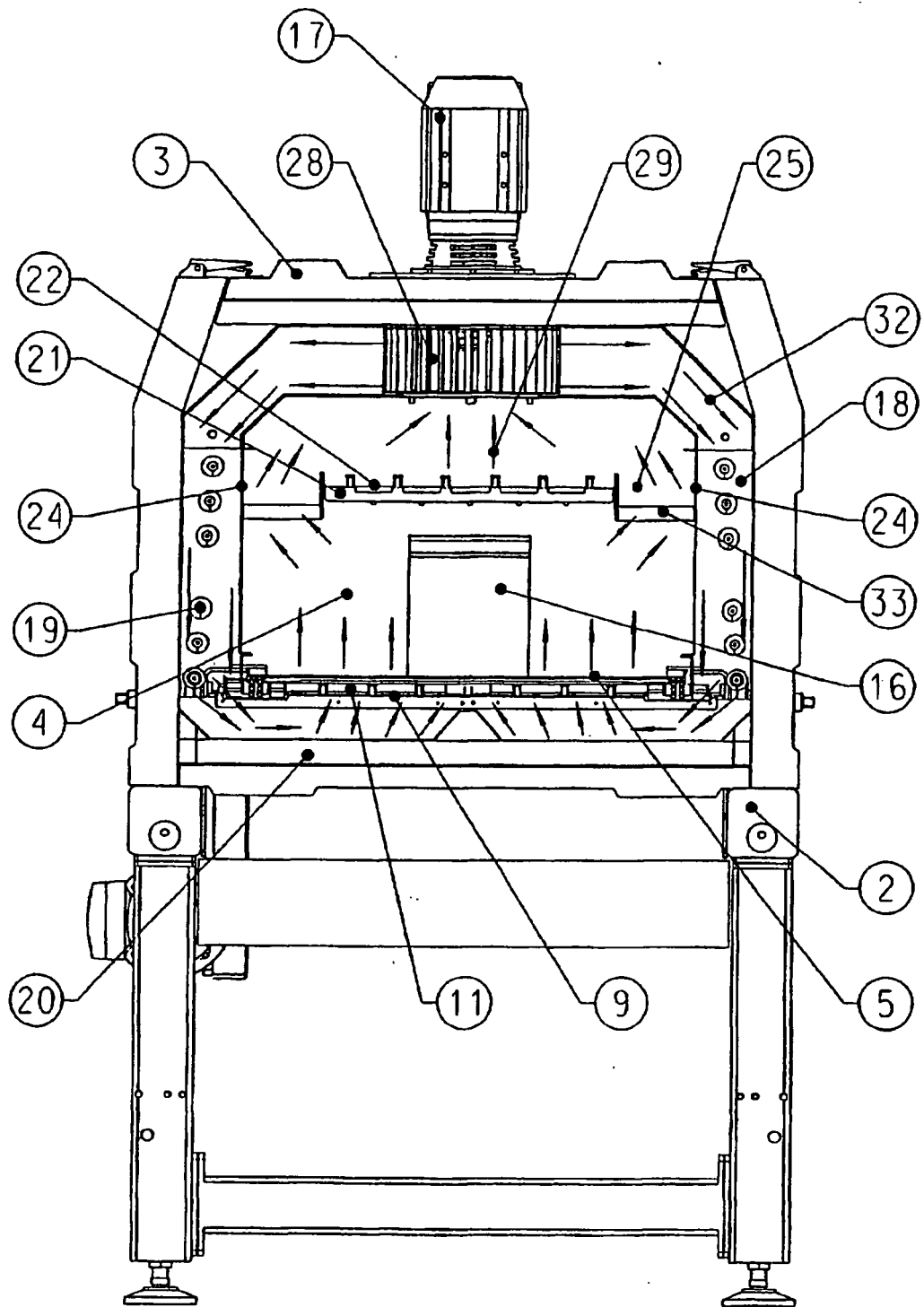
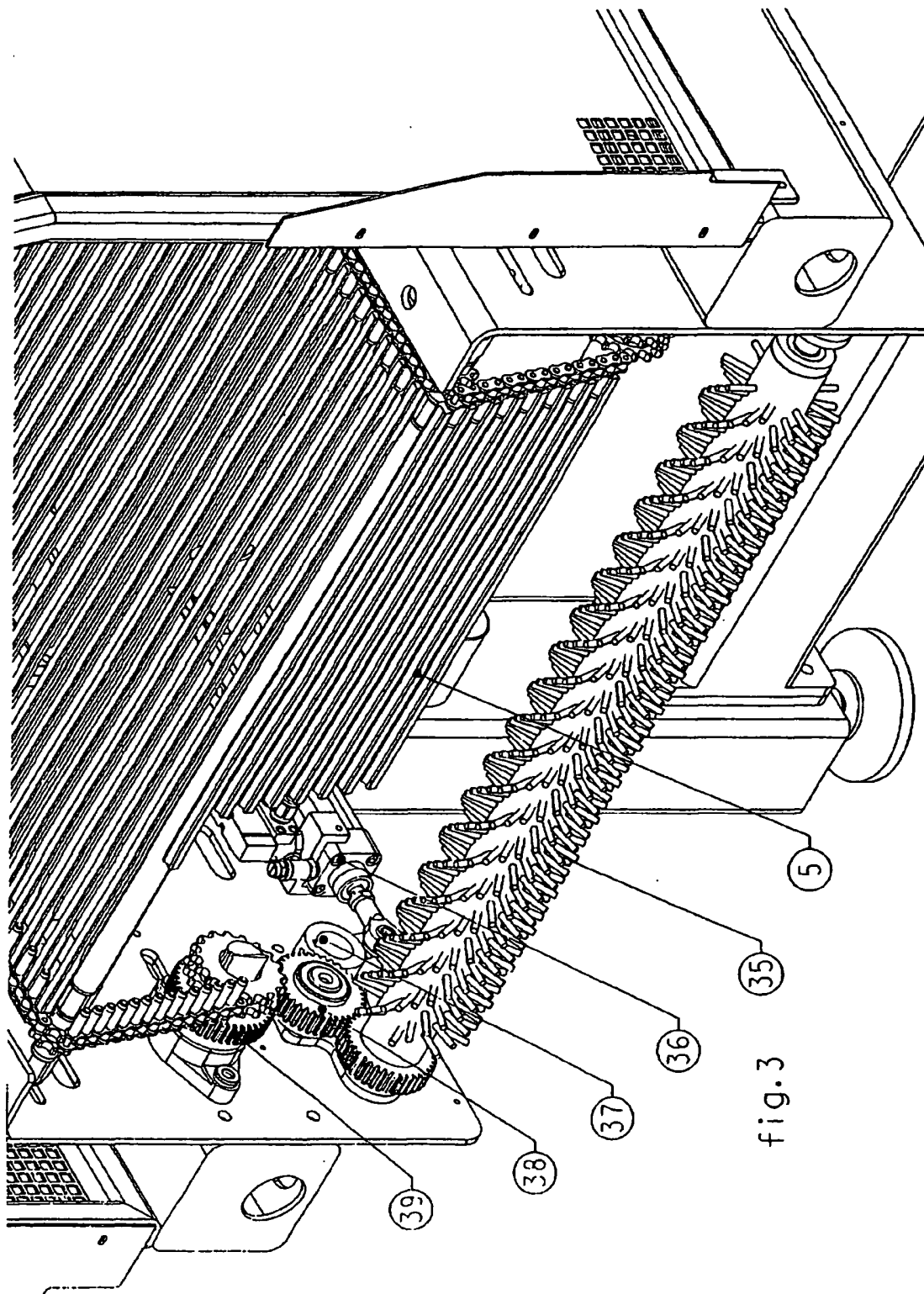


fig.2



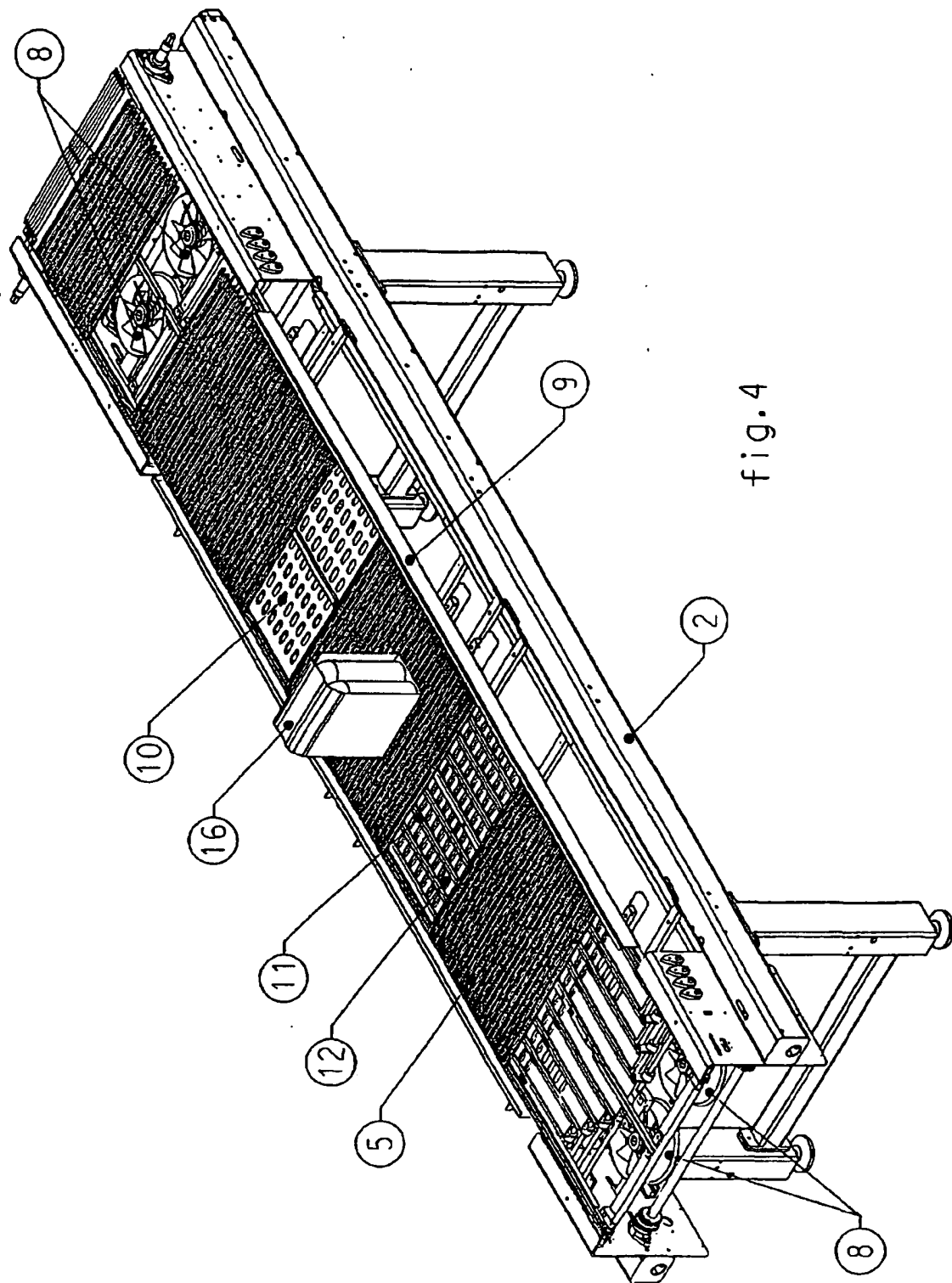
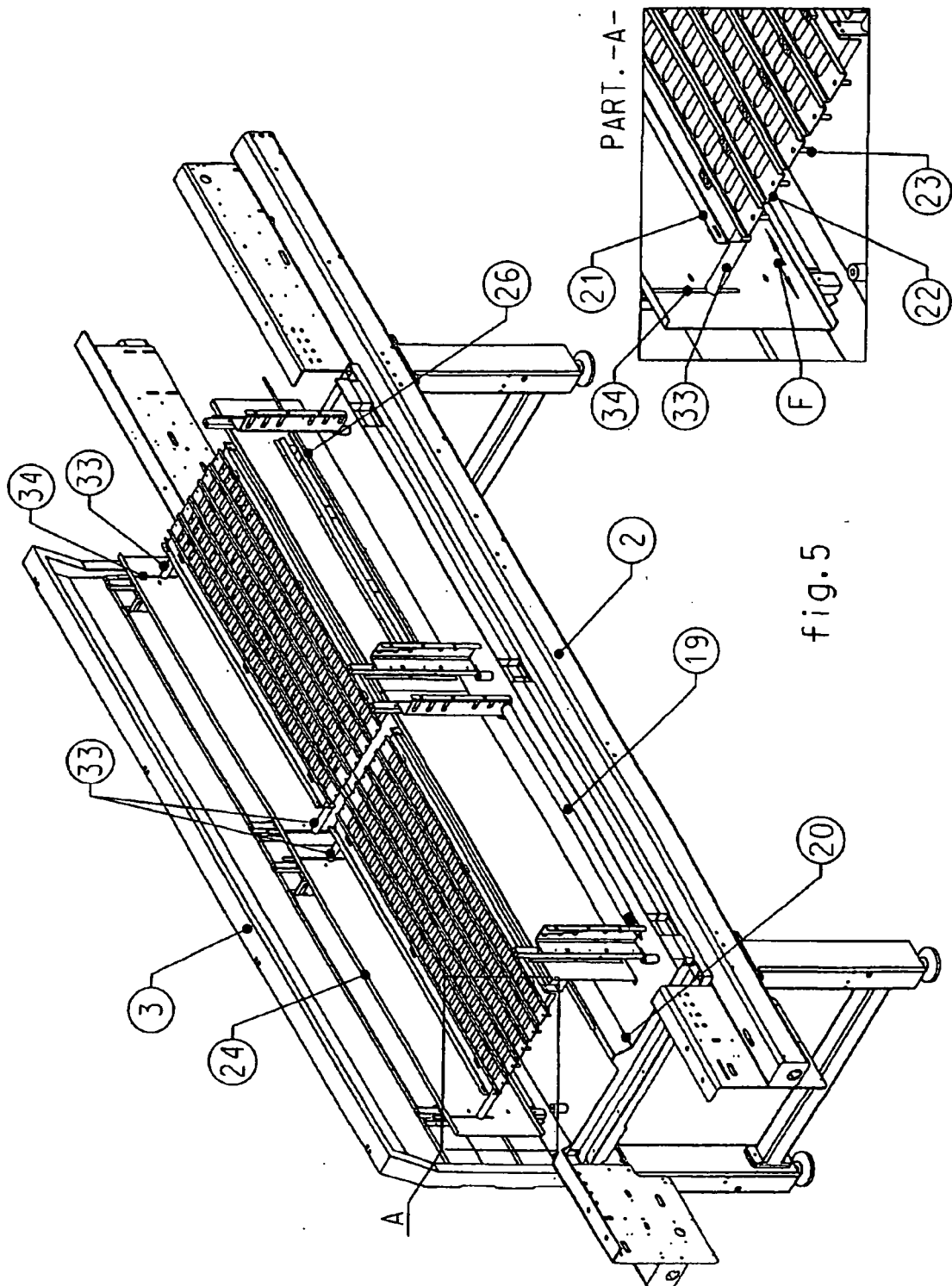


fig. 4



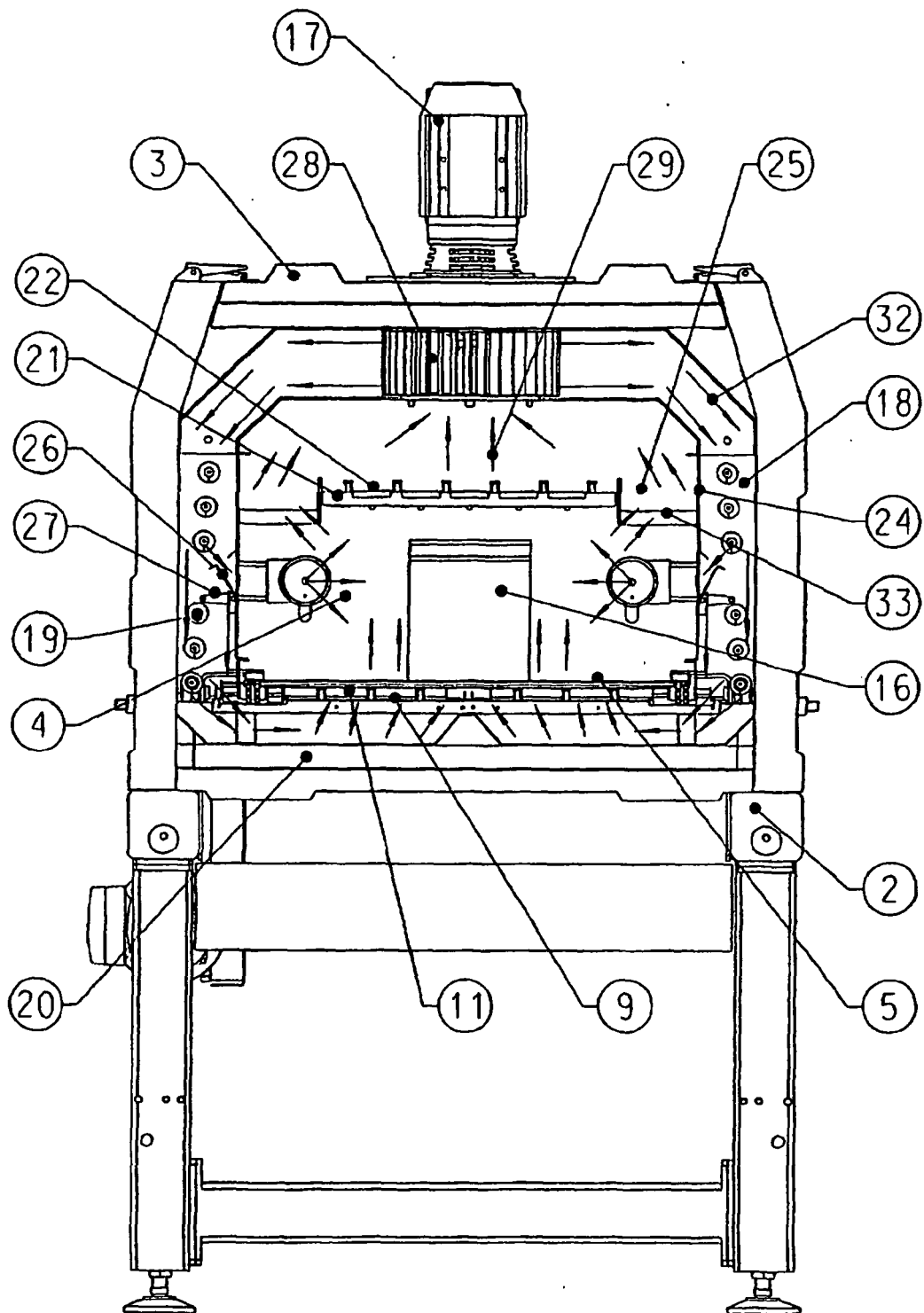
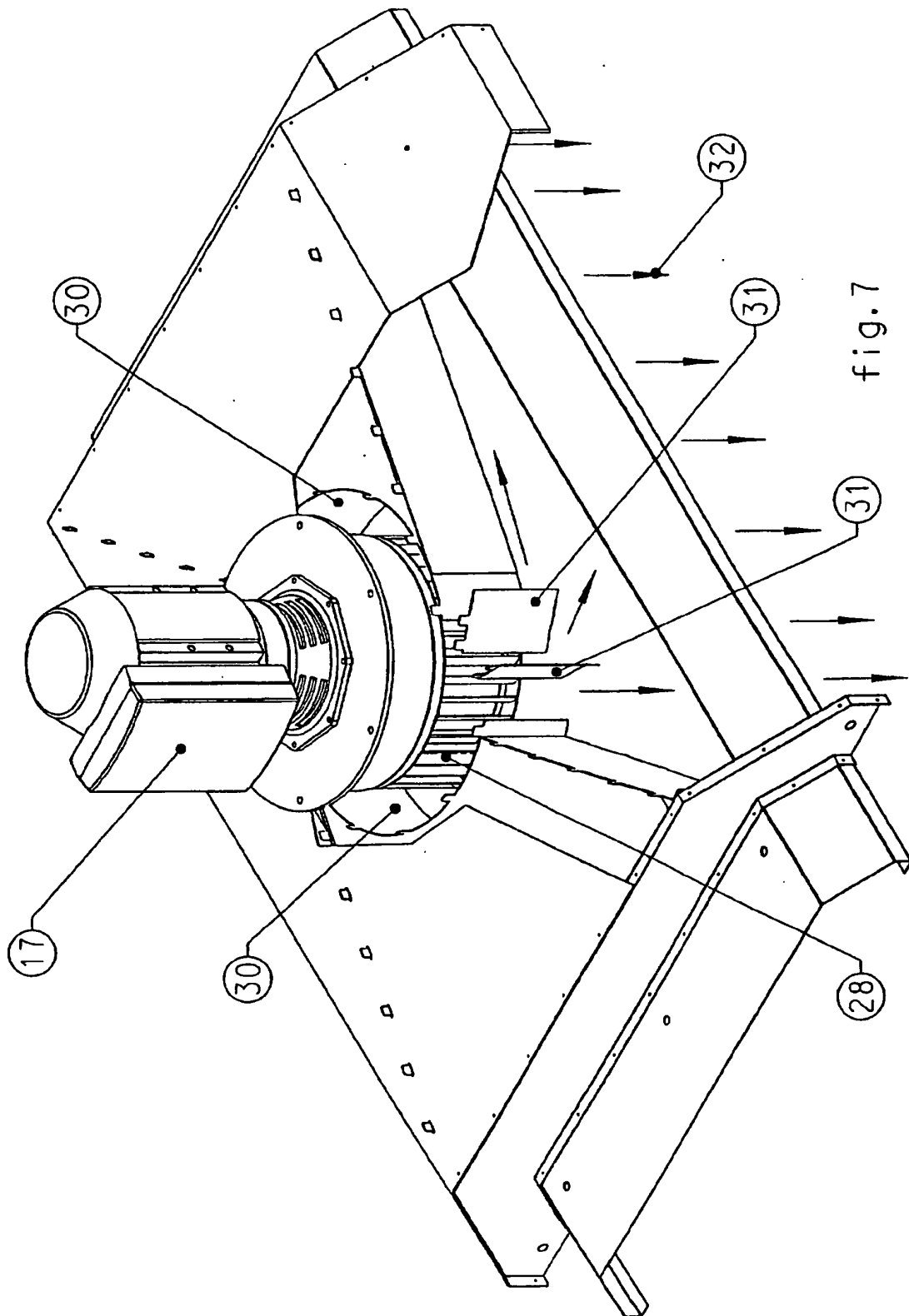


fig.6



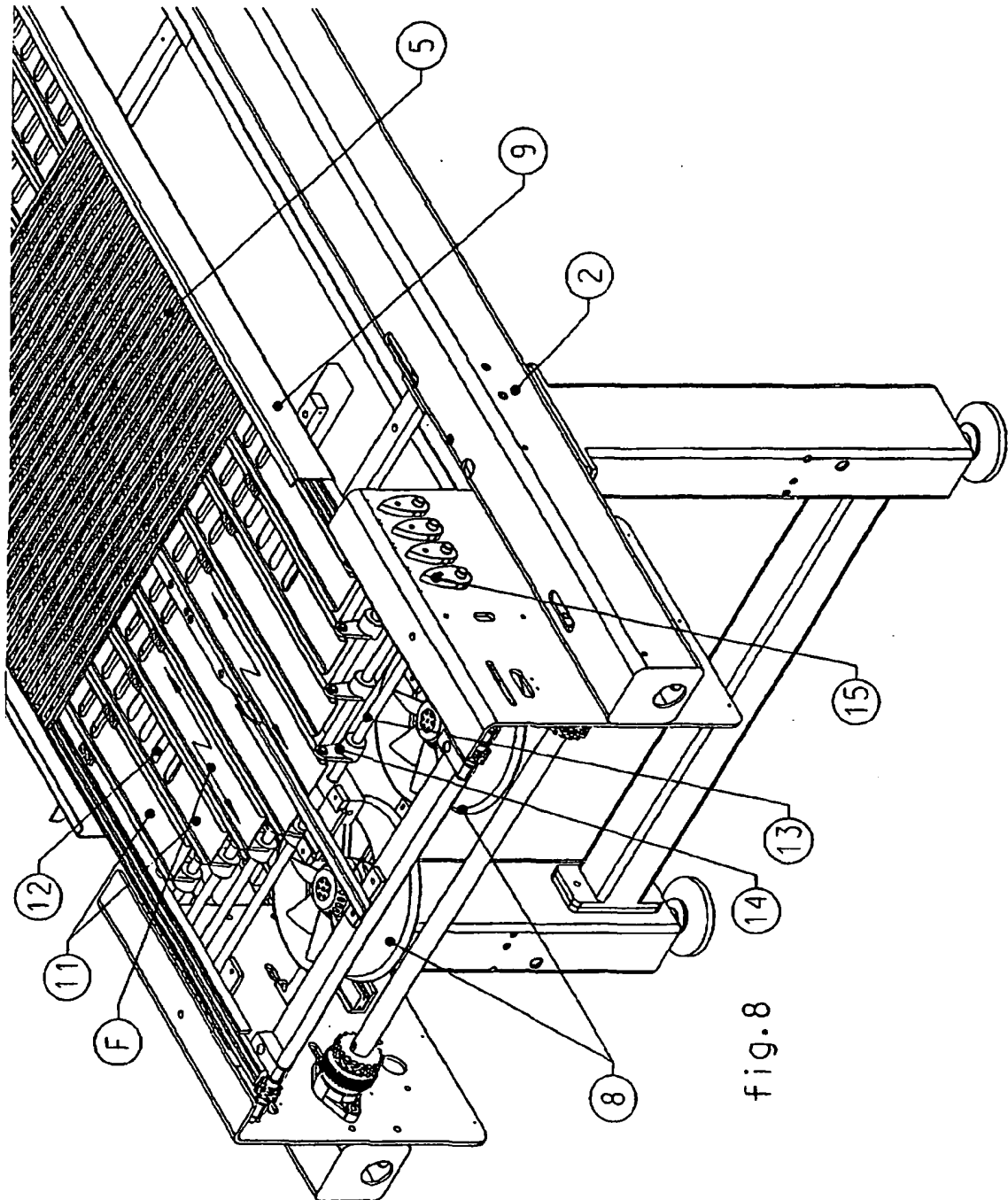


fig. 8

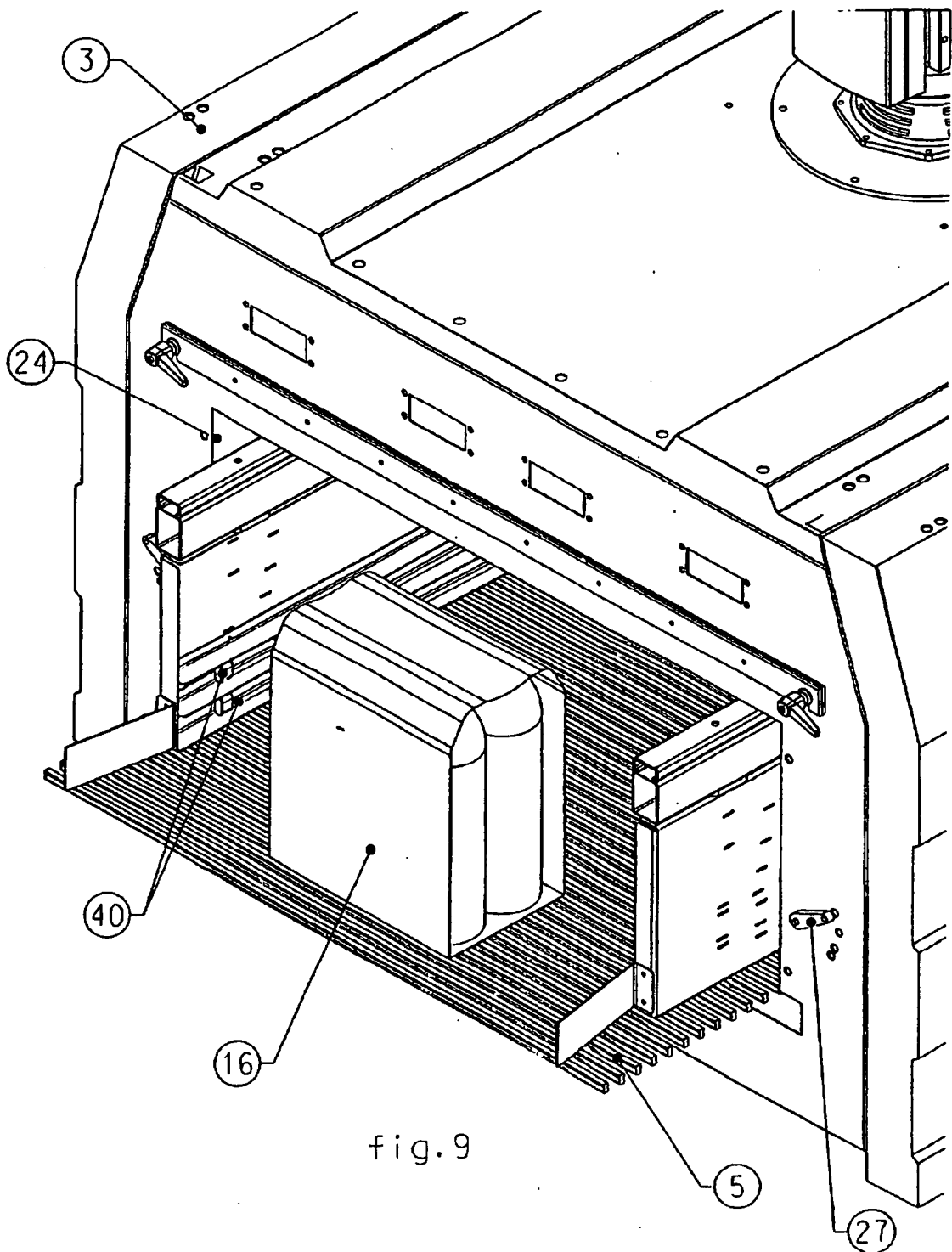
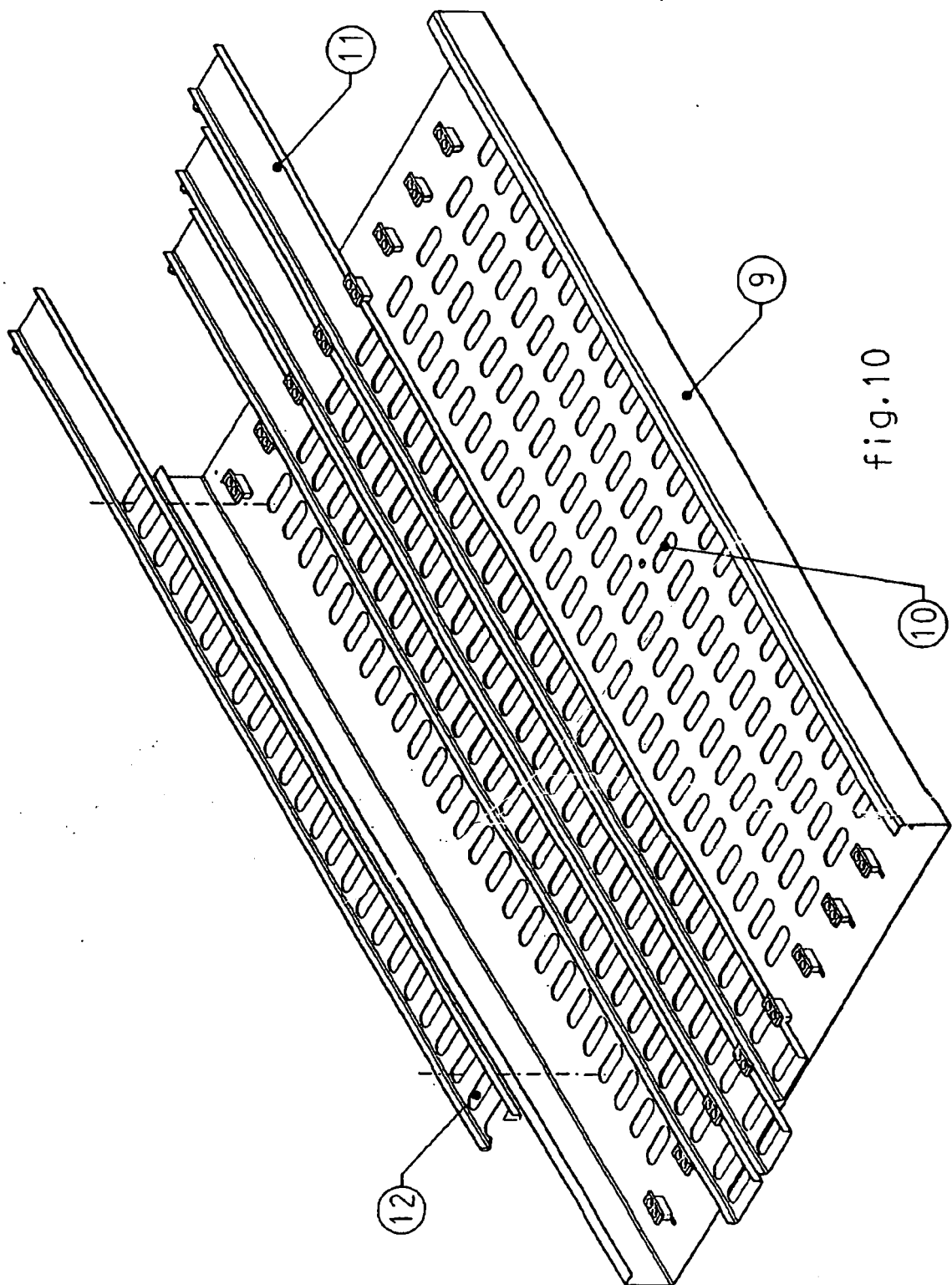


fig. 9



REFERENCES CITED IN THE DESCRIPTION

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